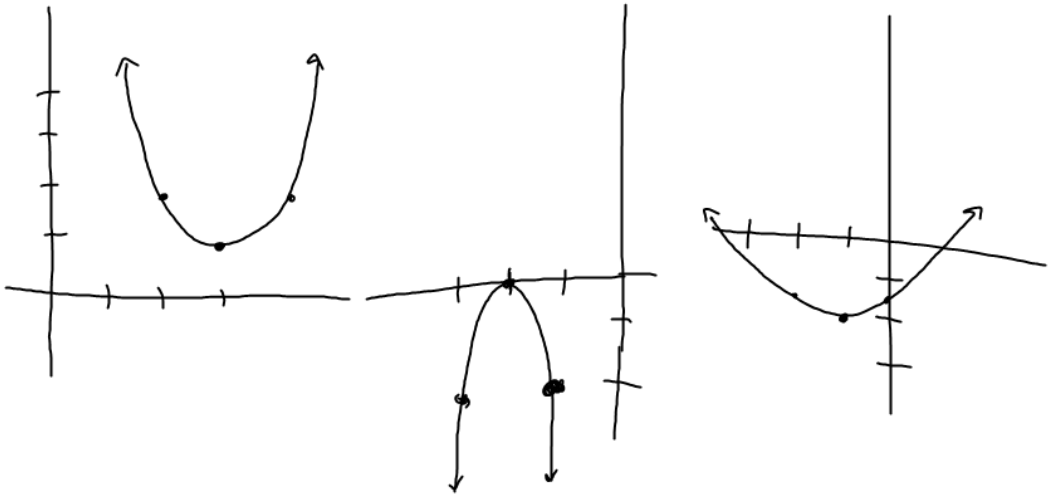
① Graph each function → watch out for the a-term.

(a) $y = (x-3)^2 + 1$ (b) $y = -2(x+2)^2$ (c) $y = \frac{1}{2}(x+1)^2 - 2$



② Solve $f(x) = 2(x-1)^2 + 4$ if $f(x) = 76$

$76 = 2(x-1)^2 + 4$

$-4 \qquad -4$

$\frac{72}{2} = \frac{2(x-1)^2}{2}$

$\sqrt{36} = \sqrt{(x-1)^2}$

$\pm 6 = x - 1$

$+ \qquad +1$

$X = 7, -5$

x	-1	1	2
y	17	17	8

$y = ax^2 + bx + c$

$17 = a(-1)^2 + b(-1) + c$

$17 = a(1)^2 + b(1) + c$

$8 = a(2)^2 + b(2) + c$

$\Rightarrow$

$1a - 1b + c = 17$

$1a + 1b + c = 17$

$4a + 2b + c = 8$

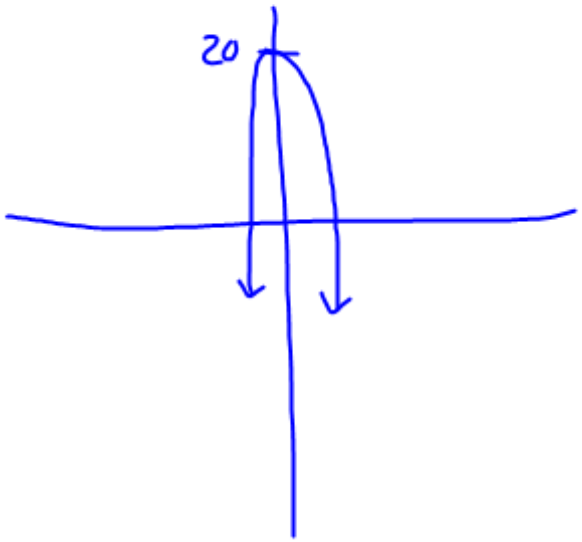
$$\begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & 1 \\ 4 & 2 & 1 \end{bmatrix} \cdot \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 17 \\ 17 \\ 8 \end{bmatrix}$$

$[A] \cdot [X] = [B]$

$[X] = [A]^{-1} \cdot [B]$

$$[X] = \begin{bmatrix} -3 \\ 0 \\ 20 \end{bmatrix}$$

$y = -3x^2 + 20$



$y = ax^2 + bx + c$

vertex:

$x\text{-coord} = \frac{-b}{2a}$

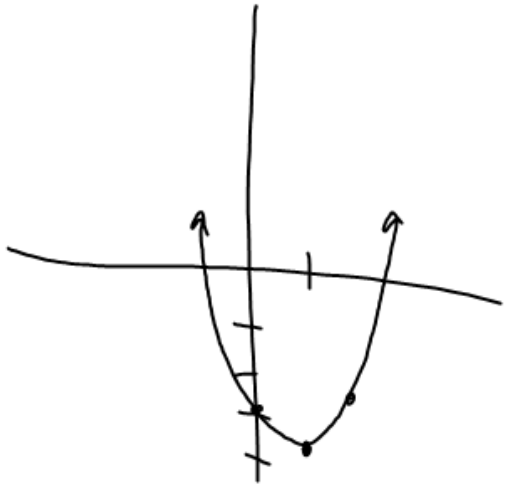
y-coord = get x-coord first, then plug it into the eq.

$f(x) = x^2 - 2x - 3$

$x\text{-coord} = \frac{--2}{2(1)} = 1$

$y\text{-coord} = (1)^2 - 2(1) - 3 = -4$

vertex $(1, -4)$



vertex:

$$x\text{-coord} = \frac{-b}{2a}$$

y-coord = get x-coord first, then plug it into the eq.

$f(x) = 3x^2 + 12x + 8 \rightarrow$ find the vertex

$$x = \frac{-12}{2(3)} = -2$$

$$y = 3(-2)^2 + 12(-2) + 8 = -4$$

vertex $(-2, -4)$

4 EXAMPLE **Real-World Connection**

Economics A company knows that $-2.5p + 500$ models the number it sells per month of a certain make of unicycle, where the price p can be set as low as \$70 or as high as \$120. Revenue from sales is the product of the price and the number sold. What price will maximize the revenue? What is the maximum revenue?

$R = p(-2.5p + 500)$

$R = -2.5p^2 + 500p$

max = vertex

$x = \frac{-500}{2(-2.5)} = \$100$

$R = -2.5(100)^2 + 500(100)$

$R = \$25{,}000$

Sect. 5.2, p. 248

4-7, 14-19, 22, 23, 28, 29, 32, 33, 37-39